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MOLECULAR REGULATORY CIRCUITS TO ACHIEVE SUSTAINED
ACTIVATION OF GENES OF INTEREST BY A SINGLE STRESS

ABSTRACT OF THE DISCLOSURE

The exposure of cells, tissues and organs to "stress," such as elevated temperature, stimulates production of active heat stress transcription factors (HSF), which in turn, induce expression of genes regulated by stress promoters. Normally, the activity of stress promoters declines after cells, tissues and organs are returned to a normal condition. Mutant forms of HSF, however, can constitutively transactivate stress genes, in the absence of stress. By taking advantage of such mutant HSF, molecular circuits can be devised to provide a sustained expression of a gene of interest using a single application of stress. One form of molecular circuit comprises (a) a first nucleic acid molecule that comprises a gene encoding a transcription factor and a promoter activatable by stress and by the transcription factor, wherein the stress-activatable promoter and the transcription factor gene are operably linked, and (b) a second nucleic acid molecule that comprises a gene of interest and a second promoter activatable by the transcription factor, wherein the second promoter and the gene of interest are operably linked.